Advanced Firepower for the Armed MD Explorer Helicopter

NDIA Gun and Ammunition Symposium
April 11, 2001

Lisa Williams
Armed Explorer Project Engineer / Structural Analyst
MD Helicopters, Inc.

James St. Germain
Principal Systems Engineer
General Dynamics Armament Systems

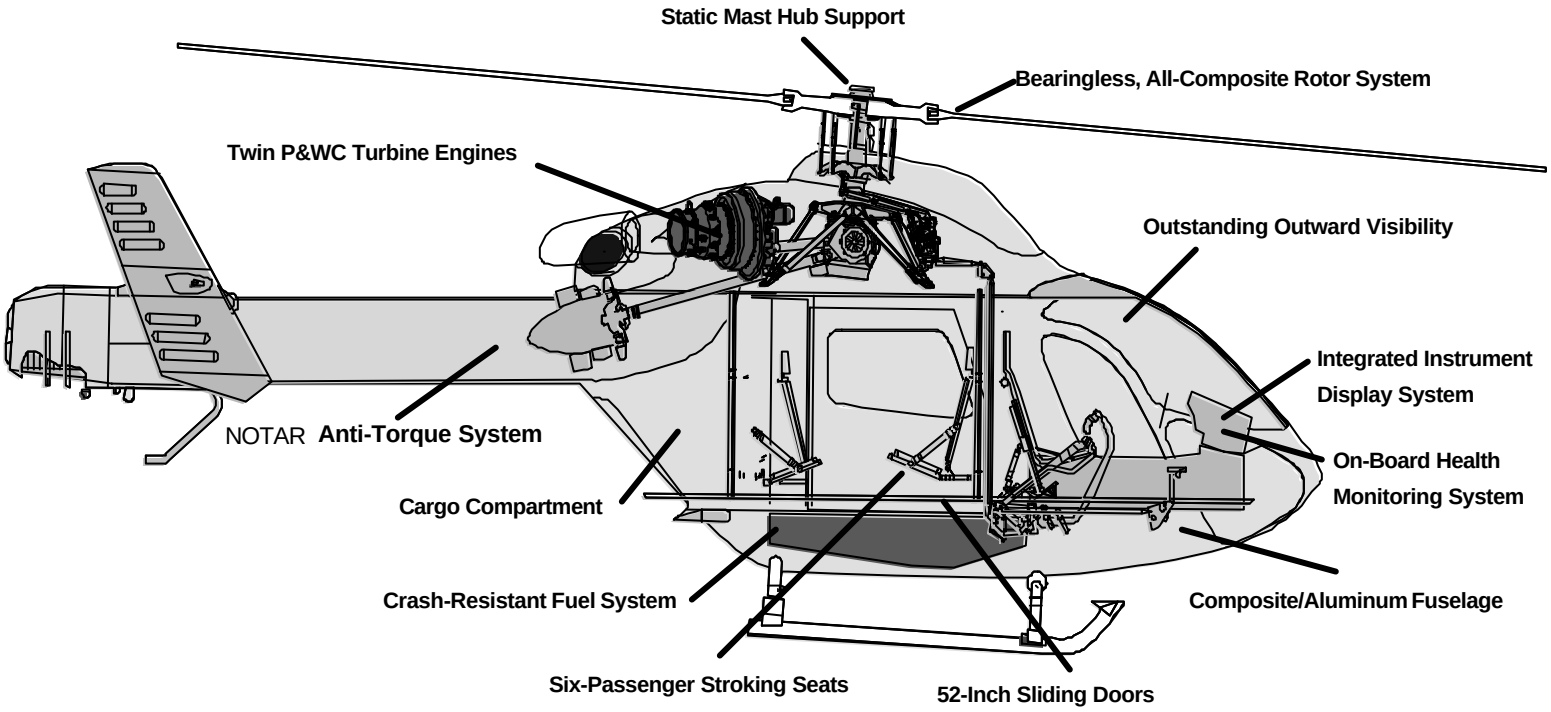
MD Product Line Legacy

- **Hughes Helicopters**
- **McDonnell Douglas Helicopter Systems**
- **Boeing**
- ***February 1999 - Boeing sells its Light Helicopters Division to RDM Holdings***

MD Helicopters

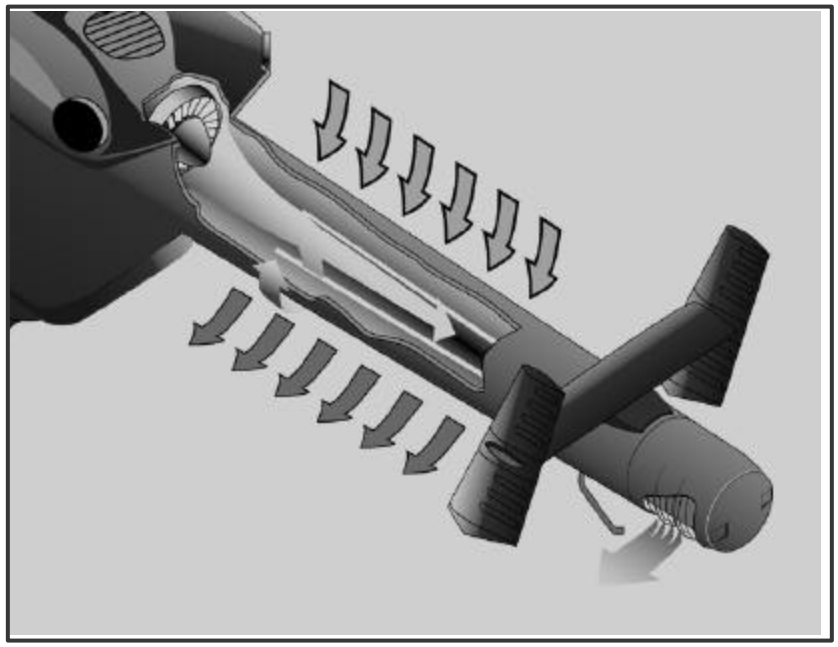
MD Explorer Features

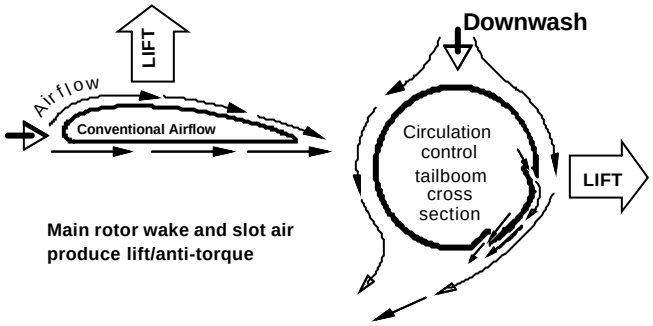
At a Glance



NOTAR®System – How It Works

The NOTAR® system consists of an enclosed articulated fan driven by the main transmission, a circulation control tail boom, direct-jet thruster, and vertical stabilizers. Low pressure air, forced through two slots on the tail boom, causes the main rotor downwash to "hug" the contour of the boom (coanda effect), creating lateral lift that counteracts main rotor torque.





NOTAR SYSTEM

Safety Features Make the MD Explorer Well Suited To Its Primary Markets

- Air Medical
- Corporate / Oil Platform
- Law Enforcement

The Armed MD Explorer

Armed Explorer Test Team

MD Helicopters, Inc.
Test Aircraft, Systems Integration

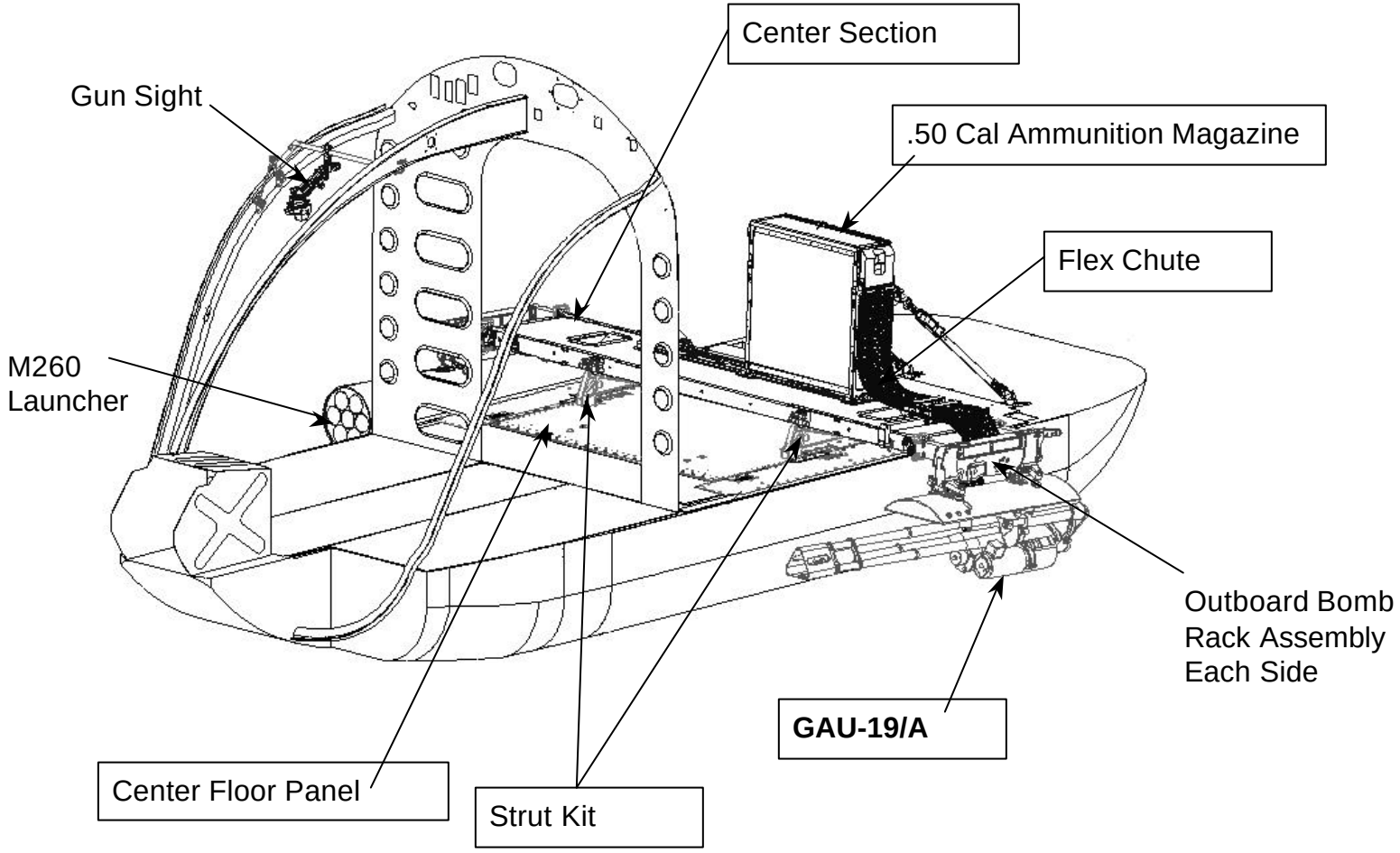
General Dynamics Armament Systems
GAU-19/A 0.50 Caliber Gatling Gun and 70 mm Rockets

Contract Fabrication and Design, Inc.
Ordnance Mounting System, Gun Sight, Test Range Facilities

Global Helicopter Technologies
Test Planning, Instrumentation and Data Reduction

Grigg Technologies
Armament Management System

Plank System Components



Multi-Mission Flexibility

- With dual provisions, the MD Explorer is quickly converted from a utility aircraft to a lethal weapons platform
  - Remove hoist and cabin seats
  - Trade sliding cabin door for folding door
  - Install plank system

SYSTEM CONFIGURATION

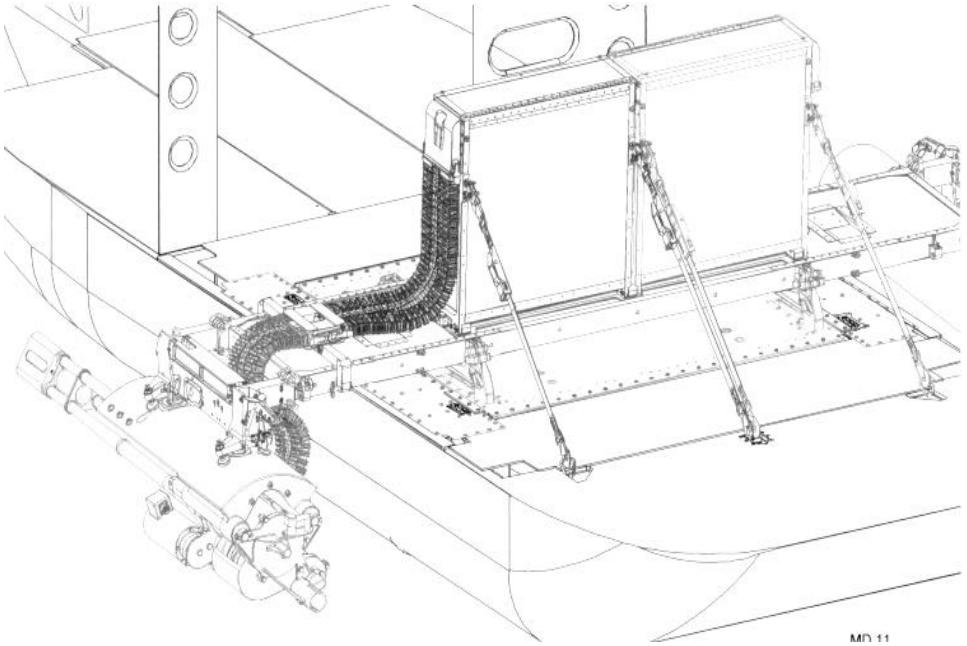
- **GAU-19/A Weapon System on Port Side**
  - **Fixed forward fire**
  - **28 VDC Power**
  - **1300 SPM**
  - **500 Rounds**
  - **NVG Compatible**
  - **Jettisonable**
  - **Adjustable Boresight**

SYSTEM CONFIGURATION

- **HYDRA-70 Rocket Launcher on Starboard Side**
  - **7 Tube Launcher**
  - **Jettisonable**

SYSTEM CONFIGURATION

- **Plank System with 14” Bomb Racks**
- **Two 500 Round Ammunition Containers**
- **Dual Weapon Station Digital ECU**
  - **Manual safing**



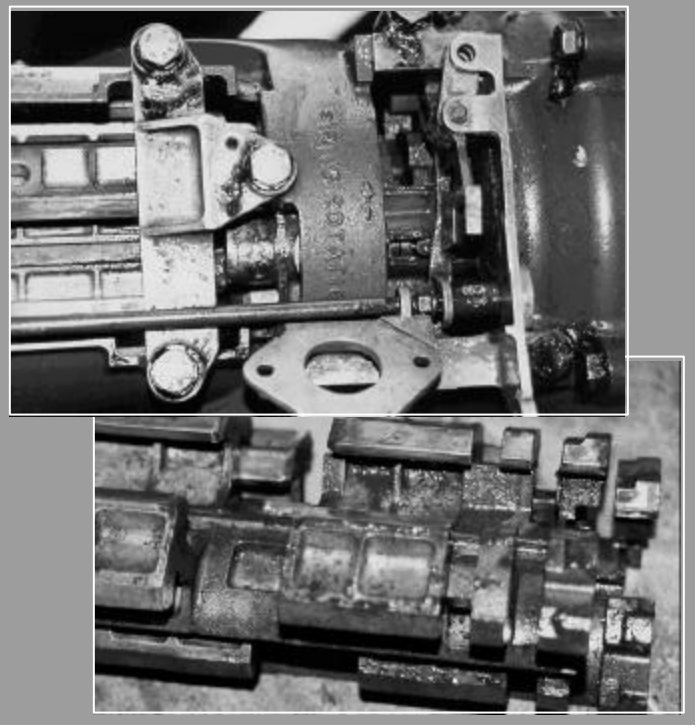
GAU-19/A SELECTION CRITERIA

- **Extreme Corrosion Resistance**
- **High Durability**
- **High System Lethality**
- **Low Aircraft Loads**

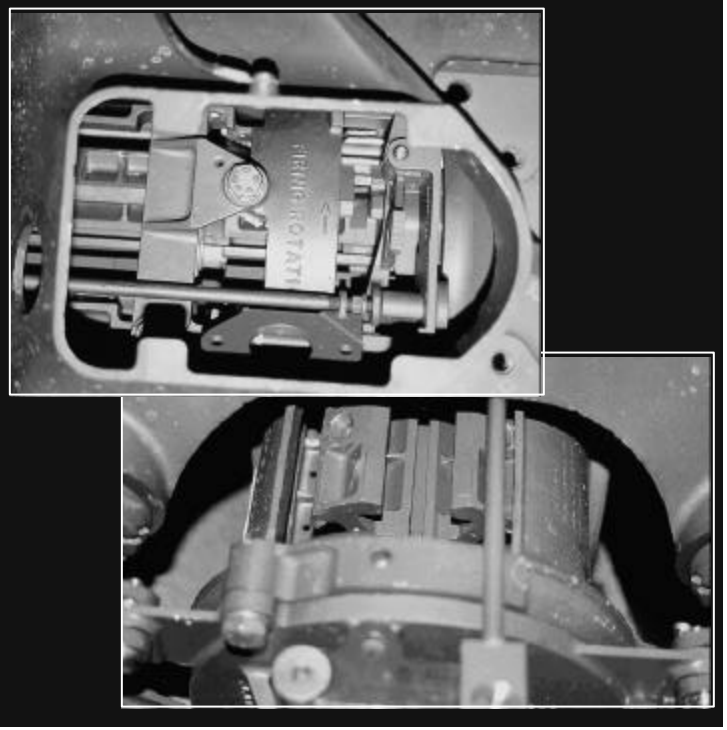
CORROSION RESISTANCE

IR&D Project ADA0961450

After 3 mo. Deployment on Navy Vessel



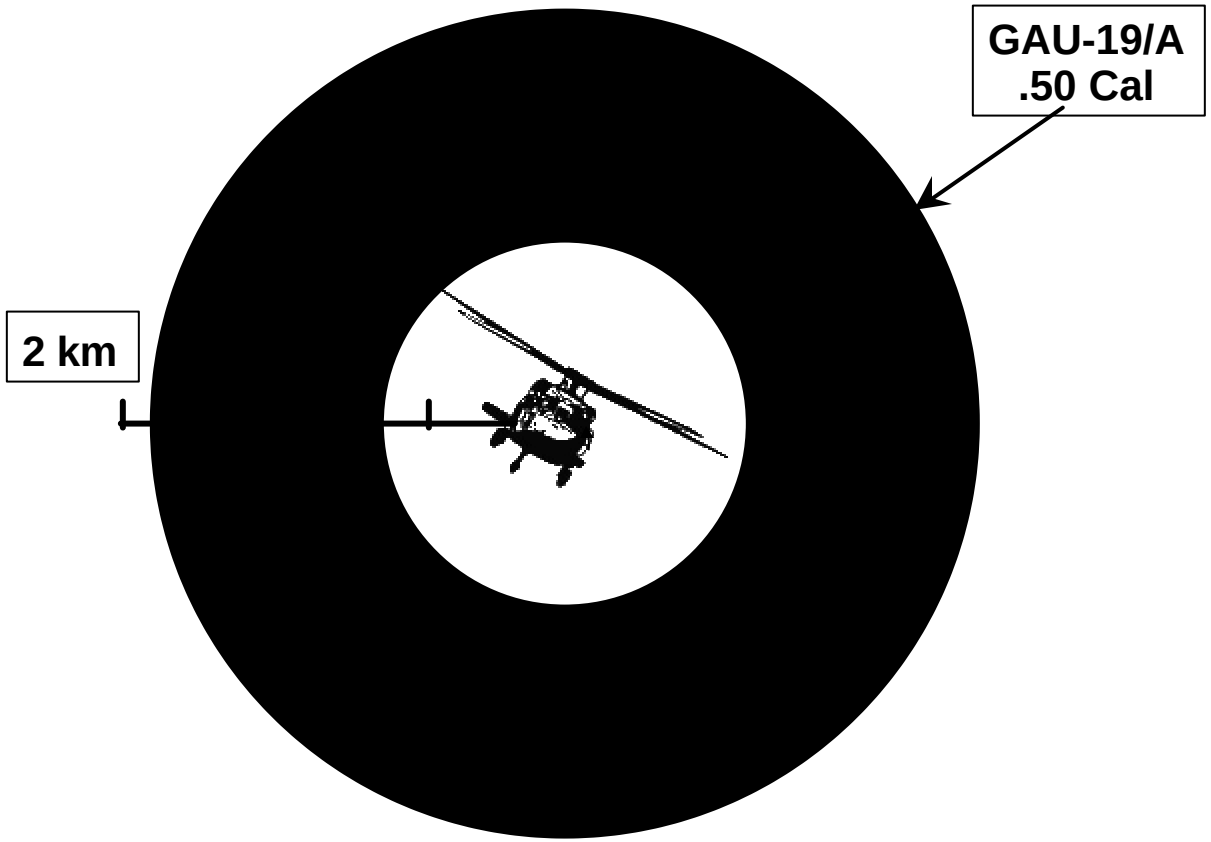
After Marinization & 500-hr Salt Fog



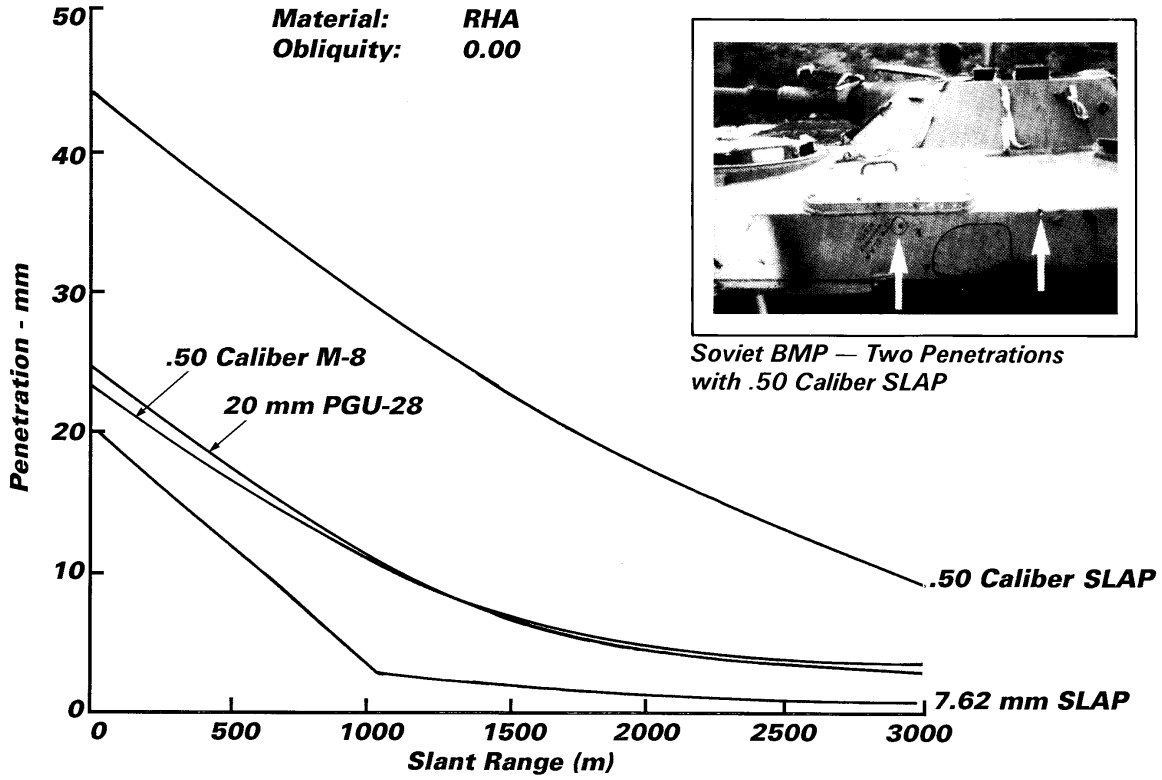
DURABILITY

- **30,000 Mean Rounds Between Failure (MRBF) System Reliability**
- **MD902 Gun System Capable of 900 Round Continuous Firing Bursts**

ENHANCED LETHALITY

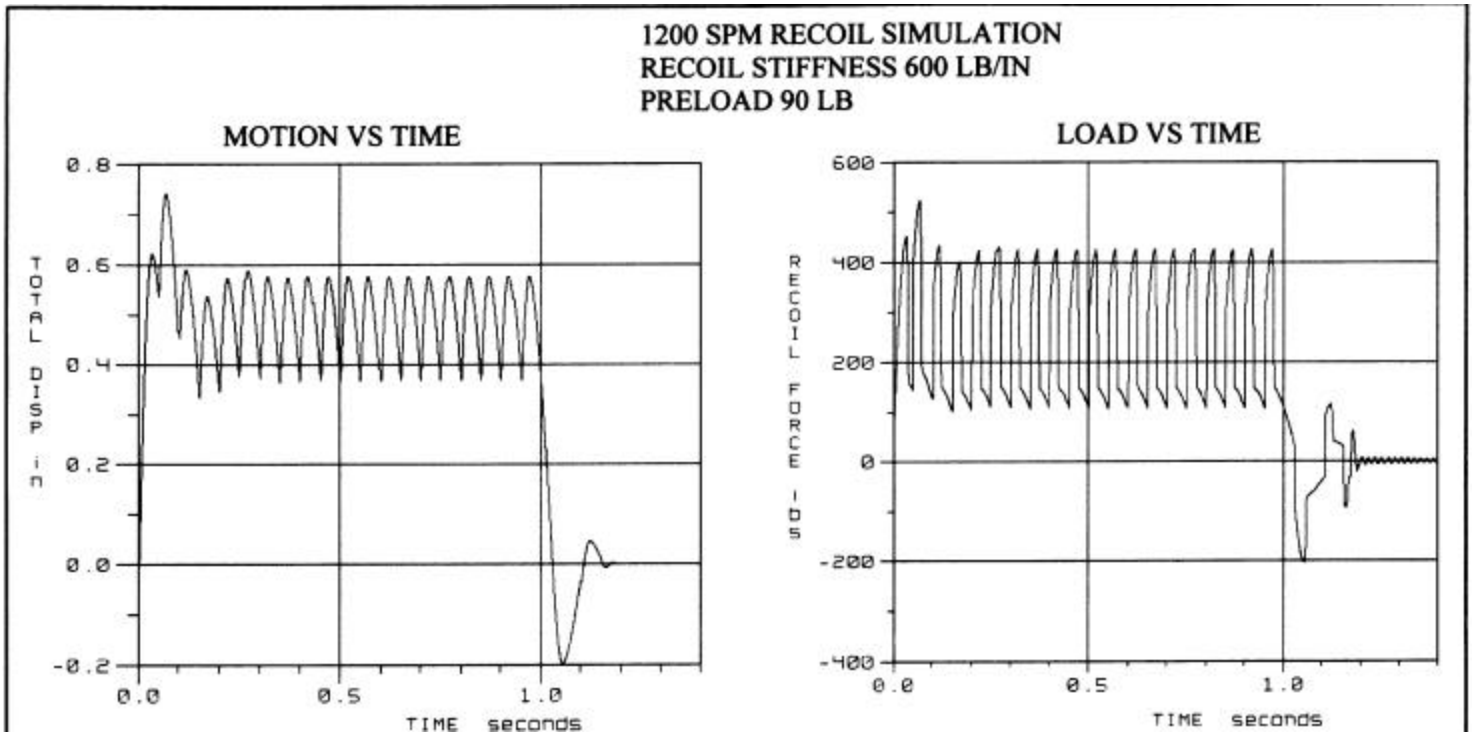


LETHALITY/PENETRATION



Soviet BMP — Two Penetrations with .50 Caliber SLAP

AIRCRAFT LOADS



Test Program

Static Firing Test- *May 2000*

Rocket Pod Jettison Test

Handling Qualities Flight Test

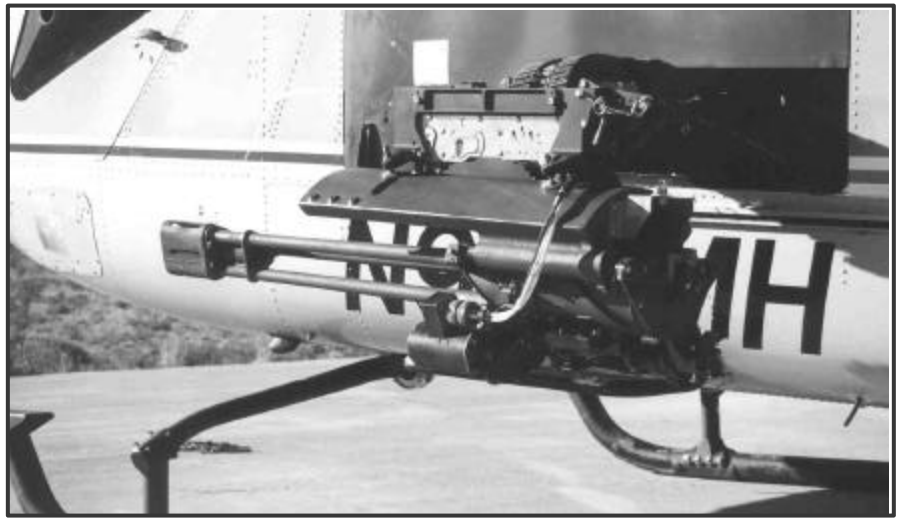
Frequency Response Tests

EMC/EMI Tests

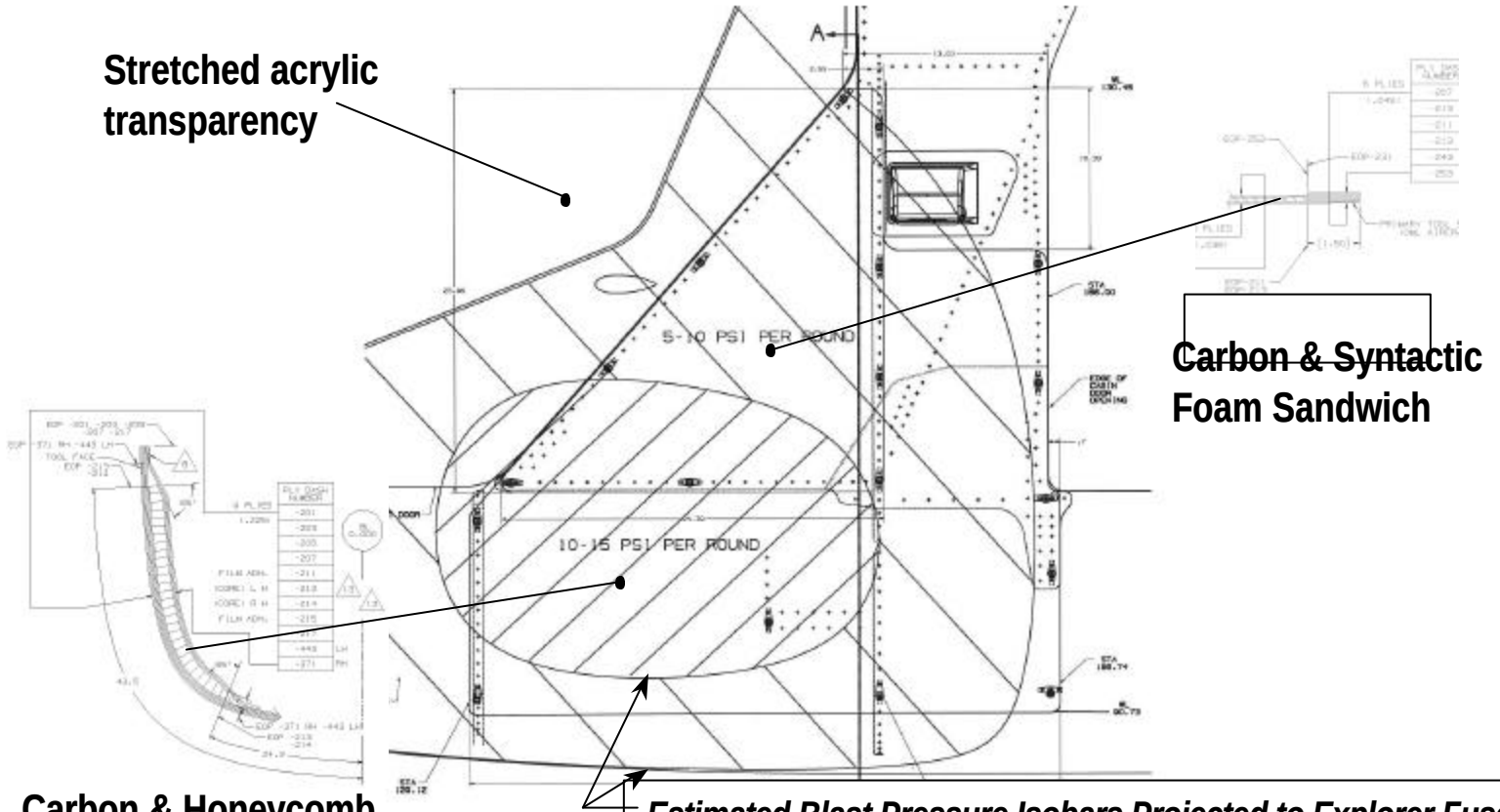
Firing Flight Test - *November 2000*

Primary Concerns Investigated by Test

- **Vibration Investigation**
- **Flight Systems Compatibility**
- **Historical Rotorcraft Concern**
  - – gas / smoke ingestion into engine
- **Unique to Carbon Structure**
  - – temperature limits and unknown response to blast pressure waves



Airframe Construction in the Blast Region



Static Test

Blast Pressure

Structural Response

Surface Temperature

System Integration

Checks

Flight Test

- Confirm No Adverse Dynamic Response to Firing Rates
- Confirm Compatibility with Flight Systems
- Monitor Structural Loads
- Operational Checks
- Pilot Approval

Video Clip

Armed MD Explorer
Flight Test November, 2000

Single and Dual
GAU-19/A guns

Test Results

- Composite fuselage responded well to blast pressures and firing rates
- Temperatures stayed well below structural limitations
- Flight systems unaffected by firing
- High marks from pilots

Conclusions

- **MD Explorer Converts Quickly from Utility to Armed Configuration**
- **GAU-19/A Combines High System Lethality with High Reliability**
- **Excellent Performance in Test**

The Armed MD Explorer offers affordable multi-mission capability with lethal firepower in its tactical role.